DOCUMENT RESUME

ED 168 358 FL 010 215

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TITLE The Nature of Cognitive Style and Its Importance to the Foreign Language Teacher.
PUB DATE 78
NOTE 34p.

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Behavioral Science Research; *Cognitive Development; Cognitive Processes; *Cognitive Style; Conceptual Schemes; Educational Research; Language Instruction; *Language Research; Learning Processes; *Learning Theories; *Second Language Learning

ABSTRACT

A brief review of the history of cognitive style research and a summary of definitions and terminology used by investigators in the area are presented. Most of the research on cognitive style has been motivated by work from three major groups: Witkin and associates; Holzman, Gardner, and associates; and Kagan and associates. Various definitions of cognitive style have been reworked from the ideas of these three groups, and there are a number of terms which are used more or less synonymously with the term "cognitive style": "learning style," "conceptual style," "cognitive strategy," "learning strategy," "mode of information processing," and "cognitive control principle." Some authors distinguish among some of these terms. Cognitive styles are traits of an individual distinct from intelligence and other abilities. Differences between cognitive styles and abilities mentioned by Messick (1976b) are presented. Some of the dimensions of cognitive styles that have been proposed are presented in three models: the Messick model, the McKenney model, and the Hill model. The following topics are also addressed: origins of cognitive style, modification of cognitive style, modification of learning environment, and cognitive style and research in foreign language learning. (SW)

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THE NATURE OF COGNITIVE STYLE AND ITS IMPORTANCE TO THE FOREIGN LANGUAGE TEACHER

by

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I. Introduction

Although there has been interest in the general problem of human cognition for many years, the term "cognitive style" did not appear in the literature until the 1950's. Since that time, however, many researchers have published many studies about cognitive style from many different viewpoints, and today there is such a variety of approaches that a person beginning an investigation of the topic may wonder how they are all related. A brief review of the history of cognitive style research and a summary of definitions and terminology used by investigators in the area may be helpful in putting things into perspective.

Cognitive style research developed out of studies of perception. While much early work on perception was done in an effort to determine what general factors operate in all persons as they process environmental stimuli, researchers such as Gardner (1953) and Witkin et al. (1962) were struck by the fact that there were clear differences among individuals in their modes of perception. Although it was tempting to try to tie these differences to differences in intelligence (which had already been widely studied both in France and the United States), these researchers became convinced that they were dealing with a separate phenomenon that was quite independent of intelligence and other abilities.

Most of the research on cognitive style has been motivated by work from three major groups: Witkin and his associates first at Brooklyn College and later at Educational Testing Service; Holzman, Gardner, and their associates at the Menninger Foundation; and Kagan and his associates at the Fels Institute. Sperry (1972) summarizes the early work of these three groups as follows:

1. Just after World War II, Witkin isolated a perceptual trait, "field dependence/independence" which was later generalized to include cognitive functions. Further research suggested that this trait appeared in many aspects of an individual's personality, all of which reflected his level of psychological differentiation.

2. Holzman and Gardner identified a number of "control principles": leveling and sharpening, equivalence range, tolerance for unrealistic experiences, flexible vs. restricted control, and differentiation vs. undifferentiation. The theme of their research was that "personality organization, called cognitive control, accounts for an individual's mode of perceiving, remembering, and thinking." These researchers view cognitive style as a "composite of cognitive controls" (Sperry, 1972, p. 96).
3. Kagan focused his research on analytic thinking. He came to the conclusion that analytic and nonanalytic style are related to two major variables: reflectivity and impulsivity.

(Many of the dimensions of cognitive style mentioned in this summary will be discussed at greater length later in this paper.)

It is obvious that, while the work of these three groups of researchers may overlap to some degree, there are some important differences among them in definition, content, and emphasis. To add to this confusion, other investigators both from within psychology and outside it have become interested in aspects of cognitive style and have taken portions of the ideas discussed above and reworked them to fit their own needs. (From the latter group, educators have been particularly active.) One can get a feel for the differences in emphasis from the following definitions:

McKenney and Keen (business administration) -- "Cognitive style reflects an individual's propensity and preference for coming to terms with the data-stimuli of his environment through particular modes of thinking that are partly conscious strategies and partly unconscious habits" (Martens, 1975, p. 1).

Messick (educational psychology) -- Cognitive styles are ways of processing information which are "conceptualized as stable attitudes, preferences, or habitual strategies determining a person's typical modes of perceiving, remem-

bering, thinking and problem solving. As such, their influence extends to almost all human activities that implicate cognition, including social and interpersonal functioning" (Messick, 1976b, p. 5).

Ausubel (educational psychology) -- Cognitive style "refers both to individual differences in general principles of cognitive organization . . . and to various self-consistent idiosyncratic tendencies . . . that are not reflective of human cognitive functioning in general. It reflects differences in personality organization as well as in genically and experientially determined differences in cognitive capacity and functioning; and in a very real sense, it mediates between motivation and emotion, on the one hand, and cognition, on the other" (Ausubel, 1968, p. 170, referring to Paul, 1959).

Schulz (education) -- "A student's learning (or cognitive, or conceptual) style can be defined in brief as the way an individual learns best, considering a number of relevant factors, such as preferred environment, emotional and social setting, need for structure, cultural influences, preferred sensory modalities, reasoning patterns, and memory factors" (Schulz, 1977, Introduction).

Note that the first three definitions tend to emphasize the internal processes of the learner, while Schulz additionally takes into account the influence of external factors on how the learner processes information.

In line with the various definitions of cognitive style, there are a number of terms which are used more or less synonymously with the term "cognitive style"; learning style, conceptual style, cognitive strategy, learning strategy, mode of information processing, and cognitive control principle as well as cognitive style are all seen in the literature referring to approximately the same construct. (One should note, however, that some authors distinguish among some of these terms; in particular, a distinction

is often made between style and strategy, the former being a basic pervasive component of personality and the latter, a more superficial, potentially changeable mode of reacting to a particular type of situation.)

As was mentioned earlier, cognitive styles are traits of an individual distinct from intelligence and other abilities. Messick (1976b) points out some differences between cognitive styles and abilities which illuminate their respective features:

1. Abilities refer to the content of cognition (what kind of information is being processed by what operation in what form?). Cognitive styles address the question of how the behavior occurs.
2. Abilities measure maximal performance; cognitive style, typical performance.
3. Ability dimensions are usually thought of as being unipolar; they vary from zero to a lot. Cognitive styles are usually represented as ranging from an extreme of one quality to an extreme of another contrasting quality, with each end of the bipolar scale having different implications for cognitive functioning.
4. Related to (3), abilities are almost always value-laden; having more is better than having less. Cognitive styles, on the other hand, are "value-differentiated", each pole representing a useful trait in some situations.
5. Abilities are usually specific to a fairly limited range of activity. Cognitive styles typically cut across domains, serving as "high-level heuristics that organize lower level strategies, operations, and propensities -- often including abilities" (p. 9).
6. Measurement of abilities has historically been in the province of education, and the instruments used have been those which could be adapted to the school setting -- usually pencil-and-paper tests. Measurement of cognitive styles has historically been made in the psychological laboratory and therefore has been carried out with

clinical apparatus and methods, usually designed for individual testing. This is not to say that cognitive style cannot be measure by education-type instruments; indeed, people today who are interested in utilizing the notion of cognitive style in the classroom are experimenting with instruments which can easily be used on a large scale.

It is undoubtedly clear from the discussion thus far that cognitive styles are very closely related to personality traits. Many authors (e.g., Chastain, 1975, and Naiman et al., 1978) group them together, perhaps regarding the former as a subset of the latter. Whether the different aspects of cognitive style studied by various investigators are in fact really altogether different dimensions is a tantalizing but elusive question. Each investigaor has framed his hypotheses in terms different from any other investigator's and has used his own tests for determining the range of variation in the style he was measuring. Some of these tests appear to have questionable construct validity, and seldom can the results of any two of them be meaningfully compared.

In an effort to get some sort of answer to this question, Mos et al. (1974) performed a factor analysis on a number of cognitive style measures used by different investigators and found that eight separate factors emerged. Witkin (1976) reports that Messick is working on a factor analysis of all cognitive styles on record. This would represent a major advance in the defining and codifying of cognitive styles and in the identification of reliable tests with which to measure them, and would allow educators to proceed with a good deal more assurance in their research on the relationship of cognitive styles to learning processes.

II. Models of Cognitive Style

Let us now take a closer look at some of the dimensions of cognitive styles which have been proposed. Martens (1975) presents

a number of these in three models:

A. The Messick model. Messick (1970) lists nine bipolar dimensions of cognitive style which have been examined systematically by various researchers. Kogan (1971) elaborates on these dimensions and describes some of the tests used to measure them. (It should be noted that few individuals demonstrate the style at the extreme of each dimension. Most people are somewhere in between.) The dimensions are as follows:

1. Field independence vs. field dependence. First investigated by Witkin and his associates, field independence/dependence has been the most thoroughly studied of all cognitive style dimensions. It involves "an analytical, in contrast to a global, way of perceiving [which] entails a tendency to experience items as discrete from their backgrounds and reflects ability to overcome the influence of an embedding context" (Messick, 1970, p. 188, quoting Witkin et al., 1962)

> The Witkin group has relied on three assessment procedures: the Body Adjustment Test (BAT), the Rod and Frame Test (RFT), and the Embedded Figures Test (EFT). The BAT consists of a tilting chair within a tilting room, the seated subject being required to adjust the chair to the true vertical. The subject's score represents the deviation of the chair's adjusted position from the true upright. The RFT offers a luminous rod within a luminous frame in a completely dark room. The subject's task is to adjust the rod to the true vertical when rod and frame are tilted in the same or opposite directions. Degree of absolute deviation of the rod setting from the true upright constitutes the subject's score. Finally, the EFT is comprised of a set of complex geometric patterns in which simple figures are embedded. Amount of time required to locate these simple figures is the subject's score.
>
> It should be noted that all four [sic] tests have yielded satisfactory reliability coefficients in terms of both internal consistency and test-retest analyses. With respect to the relationships among the criterion measures, Witkin, Goodenough,

> and Karp (1967) report a high level of inter-task consistency for groups ranging in age from eight to twenty-one. Hence, there is empirical justification for Witkin's procedure of combining the measures into a composite perceptual index. (Kogan, 1971, pp. 247-8)

Donlon (1977) reports that Educational Testing Service has recently produced a machine-scorable version of the EFT.

Although all individuals become more field-independent as they mature, the ordering of individuals along this dimension at any given age remains relatively stable (Witkin et al., 1971). As mentioned earlier, this style seems to be highly generalized. While the measures of field independence/dependence are all perceptual, the style seems to carry over to many other arenas, such as choice of careers and relationships with other people (Witkin, 1976). Field independent people tend to enter technical fields where the ability to solve problems by analyzing and then restructuring material is important. Such people often do not put a high premium on social interaction. Field dependent people, on the other hand, are usually strongly influenced by their social environment, and they tend to choose careers in which social skills are important -- teaching, social work, etc. As one might guess from the above, men are, on the average, slightly more field independent than women in western cultures.

Field independence has been shown to correlate substantially with those measures of intelligence which require analytical skills. However, most investigations have failed to show that field-independent individuals are superior in verbal intelligence (Messick, 1970).

2. Scanning. This dimension measures the manner in which individuals deploy attention, "leading to individual

variation in vividness of experience and the span of awareness" (Messick, 1970, p. 189). Scanning has been primarily studied by the Gardner group within the framework of cognitive ego structures and other aspects of personality, and seems to have few educational applications (Kogan, 1971).

3. Breadth of categorizing. Receiving major impetus from the work of Bruner, Goodnow, and Austin (1956) on thinking, this style reflects the individual's tendency to place a typical exemplar or event in a broad category (thus minimizing the risk of excluding members which "belong") or in a narrow category (thus minimizing the risk of including members which do not "belong").

> One of the most popular procedures for assessing breadth of categorization is Pettigrew's paper-and-pencil questionnaire. Items specify the average value for a specific category (e.g., annual rainfall, width of windows, length of whales), and the subject is requested to select the most extreme members of category (such as largest and smallest) from the multiple-choice alternatives listed. As the limiting boundaries of the category set by the subject diverge from the average value provided, breadth of categorization evidently increases. (Kogan, 1971, p. 256)

4. Conceptualizing styles. These reflect "individual differences in the tendency to categorize perceived similarities and differences among stimuli in terms of many differentiated concepts" (Messick, 1970, p. 189). Sorting tasks are often used to discover an individual's conceptualizing style. (It can be seen that this style has much in common with breadth of categorization.) Kagan, Moss, and Sigel (1963) propose a threefold distinction for conceptual classification (examples are taken from Robinson and Gray, 1974): categorical (use of common class membership in relating stimuli -- e.g., dogs and sheep are both animals), descriptive (concepts formed on the basis of shared physical attributes -- e.g., dogs and sheep have four legs), and relational

(functional attributes used in associating stimuli -- e.g., dogs drive sheep). This style seems to vary in many individuals with the type of stimulus (Kogan, 1971).

5. Cognitive complexity vs. simplicity. This dimension reflects the individual's tendency to construe the world as multidimensional: does he see diversity, conflict, and contradiction or consistent regularity? While this dimension is "strongly beset by problems of adequacy of conceptualization and method" (Kogan, 1971, p. 271), there have been some attempts to apply the notions it involves in the classroom. Hunt (1966, as reported in Kogan, 1971) has used sentence-completion tests to determine a student's "complexity scores" and from these has determined how much external structuring a student needs in the learning situation.
6. Reflectiveness vs. impulsivity. Sometimes referred to as "conceptual tempo," this style has been studied extensively by the Kagan group. It involves "individual consistencies in the speed with which hypotheses are selected and information processed, with impulsive subjects tending to offer the first answer that occurs to them, even though it is frequently incorrect, and reflective subjects tending to ponder various possibilities before deciding" (Messick, 1970, p. 189). The standard measurement instrument is the Matching Familiar Figures (MFF) procedure. It "contains a standard stimulus and six variants, one of which is identical to the standard. The child is required to choose the variant that matches the standard. Response time to the first hypothesis and the correctness of the choice constitute the major variables"

(Kogan, 1971, p. 266). This style seems to have direct implications for education, and there is a large body of work relating it to reading ability (Readence, 1976; Davey, 1976) which indicates that reflective children are more successful readers.

7. Leveling vs. Sharpening. This construct

> represents reliable individual variations in assimilations in memory. Subjects at the leveling extreme tend to blur similar memories and to merge perceived objects or events with similar but not identical events recalled from previous experience. Sharpeners, at the other extreme, are less prone to confuse similar objects and, by contrast, may even judge the present to be less similar to the past than is actually the case. (Messick, 1970, p. 189)

Leveling-sharpening has been extensively studied by the Gardner group, and their Schematizing Test has become the standard assessment instrument.

> Subjects are required to make size judgments of a series of squares of gradually increasing area. In the administration of the test, the five smallest squares are presented first in varying orders on three successive occasions. The smallest square is then removed and replaced by a square slightly larger than any previously exposed. The procedure is repeated over a series of trials until almost all of the squares are replaced. (Kogan, 1971, p. 281)

8. Constricted vs. flexible control. This dimension describes "subjects' susceptibility to distraction and cognitive interference in tasks containing conflicting cues" (Kogan, 1971, p. 283). The standard criterion is the Stroop Color-Word Interference Test, in which

> the reading of color words (e.g., red, blue, green) provides a reading-speed index, the naming of colors in a series of patches offers an index of speed of naming colors, and, finally, naming the colors of the ink in which color words are printed (e.g., the word green printed in red ink) yields an index of susceptibility to interference. Generally, reading speed or speed of naming colors are statistically regressed out of the interference score. In research by the Gardner group, the regression analysis takes account only of speed of naming colors, since it is the only ability that is highly correlated with performance on the interference portion of the test. (Kogan, 1971, p. 283)

9. Tolerance for incongruous or unrealistic experiences. The least-studied of the cognitive control principles studied by the Gardner group, this dimension is a measure of an individual's "willingness to accept perceptions at variance with conventional experience" (Messick, 1970, p. 189). It would seem to be related to the notions of "belief congruence and contradiction," which measure the basic need each person feels for internal consistency, and of "open and closed mindedness" and dogmatism (Brown, 1973, p. 241).

In addition to these nine dimensions, Kogan (1971) adds a tenth which he calls "risk-taking vs. cautiousness." Investigating this issue across a variety of decision-making situations, Kogan and Wallach (1964) have found that some individuals have a much stronger tendency to take risks than others (although the nature of the decision to be made is often an influencing factor).

Messick (1976b) mentions a few other dimensions which have been discussed in more recent literature, including:

> strong vs. weak automatization, referring to "an individual's relative ability to perform simple repetitive tasks compared to what would be expected

of him in this regard from his general level of ability" (p. 20);

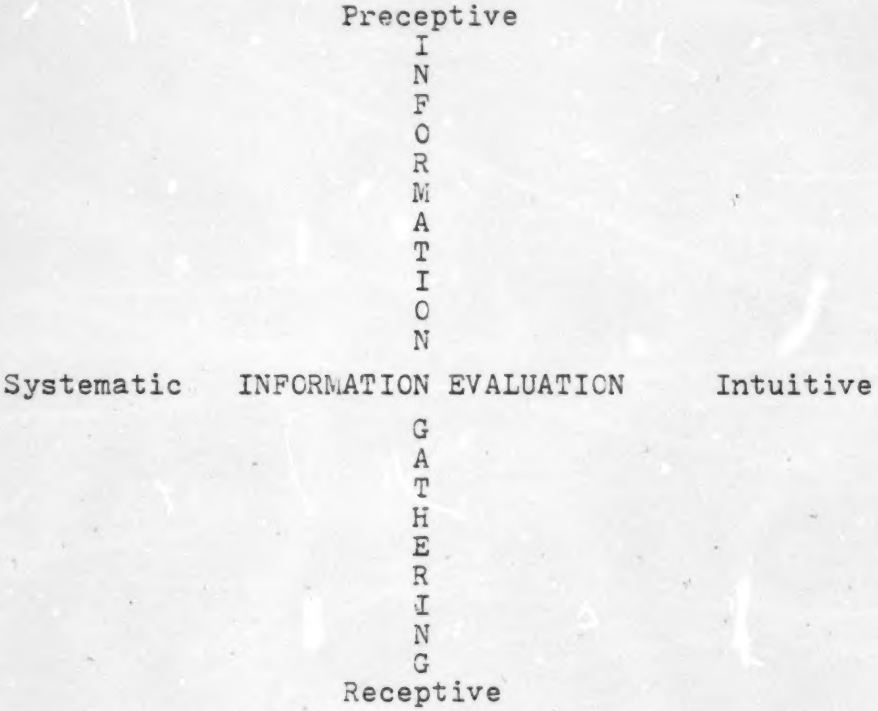
sensory modality preferences, governing whether one tends to rely on kinesthetic, visual, or auditory modes of experiencing the world;

converging vs. diverging, representing "the degree of an individual's relative reliance upon convergent thinking (pointed toward logical conclusions and uniquely correct or conventionally best outcomes) as contrasted with divergent thinking (pointed toward variety and quantity of relevant output)" (p. 22). This dimension may reflect the distinction between intelligence and creativity.

The reader can readily discern overlap among these various dimensions. However, as mentioned earlier, there has not yet been a systematic study published which spells out exactly how much duplication there is in the descriptions of the various constructs.

B. The McKenney Model. This model, developed by James McKenney and his colleagues at Harvard Business School, is based on certain assumptions about human information processing activities. "Human information processing is composed of two general modes of behavior: First, communicating with the environment to obtain data and to return data to other people. Second, organizing data received to bring relevant experience to bear to make useful predictions" (McKenney, 1972, as reported in Martens, 1975, p. 5). The basic premise of the McKenney cognitive style model is that "the world imposes huge quantities of data on the individual and that in response, the individual selects and uses only part of that data as 'information'" (Nelson, 1974). For McKenney, cognitive style consists of the conscious strategies and unconscious habits which

individuals use in gathering and evaluating information. These are distributed along two intersecting dimensions as shown:



The poles in this diagram are described as follows:

Preceptive individuals bring to bear concepts to filter data; they focus on relationships between items and look for deviations from or conformities with their expectations. Their precepts act as cues for both gathering and cataloging the data they find.

Receptive thinkers are more sensitive to the stimulus itself. They focus on detail rather than relationships and try to derive the attributes of the information from direct examination of it instead of from fitting it to their precepts.

Systematic individuals tend to approach a problem by structuring it in terms of some method, which, if followed through, leads to a likely solution.

Intuitive thinkers usually avoid committing themselves in this way. Their strategy is more one of solution testing and trial-and-error. They are much more willing to jump from one method to another, to discard information, and to be sensitive to cues that they may not be able to identify verbally.
(McKenney and Keen, 1974, pp. 80-81)

Note that an individual can vary along both dimensions, with four extremes possible: preceptive-systematic, preceptive-intuitive, receptive-systematic, and receptive-intuitive. However, not everyone has a dominant style; "thirty to forty percent of any sample seems to consist of Switchers, people who shift to accommodate the task at hand rather than attempting to impose an intuitive style on a systematic task, or vice versa" (Nelson, 1974, p. 3).

Like most investigators in the Messick model, McKenney attempts to impose no value judgments on any of the poles of his model; he merely uses them as descriptive devices. McKenney's research has been primarily in the business domain and includes applying the model to the managerial decision-making process. Recently, however, the systematic-intuitive dimension of this model has been studied in educational settings (Nelson, 1977).

C. The Hill Model. Martens (1975) has made an extensive study of the complex Hill model and summarizes it as follows:

> This model of cognitive style was developed by Joseph Hill, president of Cakland Community College [in Michigan] as part of his conceptual framework for education known as the educational sciences. The educational sciences, of which there are seven, were developed to provide a framework and a common language from the applied field known as education. The fifth science is that of cognitive style. It is composed of the first four sciences in his model. "The concept of cognitive style is expressed as, what mathematics call, a Cartesian product of sets. In this context, cognitive style can be considered somewhat related to Guilford's 'dimension of intellect'. Where Guilford's model is a Cartesian project of three sets that represent intellect, content and things, the Cartesian project designed to represent cognitive style is composed of the following four sets: 1) symbols and meaning, 2) cultural determinants of the meaning of symbols, 3) modalities of inference, and 4) neurological, electrochemical and biochemical

aspects of memory functions." (Hill, 1970) Since data on the functions of memory is still incomplete, the first three sets are currently used to represent the cognitive style model.

Cognitive Style

$$\left\{\left\{\begin{array}{c}\text{Symbols and}\\ \text{Meanings}\end{array}\right\} \times \left\{\begin{array}{c}\text{Cultural}\\ \text{Determinants}\end{array}\right\} \times \left\{\begin{array}{c}\text{Modalities of}\\ \text{Inference}\end{array}\right\}\right\}$$

Each set in this model is composed of a series of elements which interact with elements in the other sets to form the individual's cognitive style. In the first set symbols have been defined as something which stands for something else. The elements include two types of symbols; theoretical and qualitative. Theoretical symbols are those which have more generalized meaning in our society -- words and numbers. Symbols from which individuals develop more personalized meanings are called qualitative. They derive their meaning from three areas, sensory data, humanly constructed formalisms such as games and programmatic effects of objects which convey an impression of images, scenes, events or operations. Symbols are modified by each individual according to his cultural background or cultural determinants of meaning. The three major determinants are family influences, associates of friends and an individual's own personal assessment. After symbols are modified by cultural determinants, the individual makes tentative conclusions about their meaning based on his characteristic thought processes. These processes, shown as modalities of inference, may be either inductive or deductive.

(p. 7)

This model has been used by Hill and other educators in a technique known as cognitive style mapping to systematically determine the way a student learns. From such a map, an individualized learning program can be planned which will utilize his strengths and augment his skills in areas of weakness (Nunney, 1977).

III. Origins of Cognitive Style

One question that arises when one thinks about cognitive styles concerns their origins: how do they develop within an individual? Answers to this question all seem to be in terms of field independence/dependence. Witkin and Berry (1975) report the results of a number of cross-cultural studies which suggest that societal child-rearing practices play a large role in determining an individual's style along the dimension of field independence/dependence. There is a natural developmental trend in all children from field dependence to field independence which continues until puberty. However, if a child grows up in a society which encourages him to identify with an extended family or some other form of "shared-function" group, he will likely not move as far along the dimension toward field independence as the child who is encouraged to become independent of others at an early age. The same tendencies can be seen within the family: strict disciplinary practices and authoritarian parents who maintain close family connections tend to produce field-dependent children, whereas parents who do not enforce strict control over their children tend to produce field-independent children. Along these same lines, investigations have shown that in societies where the main occupation is hunting or fishing (in which the individual typically works alone), field independence is the predominant style, whereas in societies of farmers (where people must work together), most people tend to be field dependent.

Within the United States, Ramirez (1973) and Ramirez, Castañeda, and Herold (1974) report a considerable amount of evidence which suggests that Mexican-American children from traditional Mexican homes are more field dependent than Mexican-American children from non-traditional homes. Gay (1978) reports that nearly all minority children in the United States are field dependent. These findings have a number of educational implications. As Gay (1978) and Cohen (1969) point out, these children are almost certain to be at a disadvantage when they enter a typical American school which places high value on analytical skills. (People such as Ramirez and Gay feel

that there should be changes in the educational environment for these children. However, Hsi and Lim, 1977, say that Chinese-American and Japanese-American children may be equal to or even surpass Anglo-American children in mathematics and reasoning skills, and warn against treating all minorities in the same manner.)

Goodenough and Witkin (1977) report some evidence that hormonal factors may account for part of the variance in the measures of style. Since hormonal changes do not take place as early in boys as in girls, the pre-puberty developmental trend continues longer for boys, and thus the fact that men seem to be slightly more field independent than women could be accounted for by this theory. However, cultural values and expectations could also account for the difference.

Goodenough and Witkin, in the study cited above, also report some evidence that genetic factors determine field independence/dependence. However, if either biological or genetic factors have any effect, it probably is not large. Early environmental influences seem to be the most important contributors to an individual's style.

IV. Modification of Cognitive Style

There has been considerable interest in trying to discover the extent to which a person's style can be modified so that he may accomplish certain tasks (particularly in learning) more readily. In general, it appears that "those styles possessing the quality of a capacity (e.g., Witkin's analytical-global dimension) are more resistant to modification than those styles which have the properties of a strategy (e.g., conceptual groupings in sorting tasks) where the individual consciously selects a mode of approach to the task among others also available to him" (Kogan, 1971, p. 290). Readence and Bean (1977) report on some interesting attempts (motivated by the observation that reflective children are better readers) to encourage the impulsive child to become

more reflective. The techniques tried out include the use of reinforcement to increase response time to stimuli and to decrease error in making judgments about them, the use of modeling by a tutor high on the reflective scale, and the use of specific instruction in how to develop efficient strategies for scanning and recognition of distinctive features. These techniques seem to hold promise in terms of short-term results, but there is still insufficient evidence about which ones might be effective over long periods of time.

V. Modification of Learning Environment

The alternative to trying to change a student's style in order to enable him to succeed at a particular task is to try to arrange the learning environment so that he uses his predominant styles to best advantage. In some cases, this approach would seem to be beneficial (Kogan, 1971; Mahlios, 1979). For example, field-independent students can probably learn at least some types of material better if they are challenged to discover the underlying principles for themselves in independent study, whereas field-dependent students probably get more from a teacher-directed group discussion. Increasing attention is being paid to the question of matching vs. mismatching a student's cognitive style with educational treatment (here used in the broad sense to include teacher, environment, and instructional methods and materials). An example of combining matching and mismatching approaches has been mentioned earlier in this paper in the discussion of the Hill model and cognitive style mapping. Messick (1976a) discusses a variety of matching and mismatching models which are designed to correct or compensate for deficiences, capitalize on strengths, or challenge students to become more flexible in their approach to problems by increasing their repertoire of strategies and modes of functioning. However, as Messick points out, the

relative desirability of matching or mismatching depends on many factors, including the developmental level of the learner, the subject matter to be taught, the surrounding context, and the ultimate goal of education. In short, the problem is a highly complex one, and there are assuredly no easy answers. A great deal of ATI research -- aptitude-treatment interaction, where aptitude is used in the broad sense to include "any aspect of an individual that predicts response to instruction, including prior achievement, special ability, personality, and stylistic characteristics" (Snow, 1976, pp. 270-71) and treatment is defined as above -- will be necessary before even preliminary answers can be given.

The individualizing of treatment has been enhanced by the development of computers, which can be used not only in the actual instruction process but also in evaluating a student's strengths and weaknesses. Even so, prescriptions for "fixed treatments derived from aptitude-treatment interactions are probably of questionable generalizability. The stark realities of ATI research reveal recurrent inconsistencies that are apt to be indicative of higher-order interactions: thus a particular ATI result may not represent a general conclusion but instead might itself be moderated by other variables" (Messick, 1976a, p. 321, referring to views set forth in Cronbach, 1975). Treatment, in order to be of maximum benefit, may therefore need to undergo modification for a particular learner when conditions change.

VI. Cognitive Style and Research in Foreign Language Learning

Let us now look at some of the research which links cognitive style to foreign language learning. First, there have been a number of efforts to determine a student's cognitive preferences and then to tailor his program accordingly. Brown (1973) reports a study in which the Hill model was used with Spanish-American school children who were learning English. While the results were not conclusive, they did "support the hypothesis that a child learning a second language can be taught in various ways

depending upon his own affective-cognitive 'map'" (p. 238). Lepke (1977) made an exploratory study at Kent State University using the Hill method to map the styles of beginning German students. She reported results which statistically established (though for a small sample) that there is a "measurable interdependence between the level of achievement in beginning German classes and the instructional adaptation to the learner's cognitive preferences" (p. 17). Zampogna et al. (1976) have experimented with using a paragraph-completion method developed by Hunt (cf. Hunt's sentence-completion test mentioned by Kogan in connection with the cognitive complexity vs. simplicity dimension) to determine a student's preferred style, and have grouped students on the basis of their need for external structuring. They comment on the need for new criteria for measuring success in such non-traditional programs. Reinert (1977) has used the Edmonds Learning Style Identification Exercise (ELSIE) which attempts to determine whether a student learns better by means of visual images, the written word, listening, or activity (or some combination of these). All of these methods involve structured self-report instruments. Lepke (1977) also mentions the use of various less-structured types of student self reporting which can be followed up by offering learning opportunities appropriate to each student's preferences. (See Hosenfeld, 1976, for an example of an unstructured self-report technique.) Finally, a teacher can make some judgments about style by simple observation (Logan, 1973; Papalia, 1976).

Another approach which has been taken is to look at the "good" language learner in an effort to discover whether particular cognitive styles (as well as other attributes) are associated with language success. From classroom observation, Rubin (1975) has compiled a list of characteristics of the successful language learner which include: being a willing and accurate guesser, having a strong desire to communicate, not being inhibited, constantly looking for patterns in language, practicing wherever

possible, monitoring his own speech and the speech of others, and attending to meaning. Obviously, some of these are strategies which are related to cognitive styles discussed earlier in this paper. Brown (1973) reports a research study conducted at the University of Michigan (Doron, 1973) which sought to relate reflectiveness/impulsivity to reading proficiency in students of English as a second language. It was found that reflective students were slower but more accurate readers than impulsive students. Tucker et al. (1976), in a pilot study of seventh grade speakers of English who had had French instruction since kindergarten, found evidence that field independence and "adventuresomeness" (probably related to Kogan's risk-taking vs. cautiousness dimension) are relevant to successful language learning.

Naiman et al. (1978) report an extensive study made at the Ontario Institute for Studies in Education of high school students of French. Although the study "set out to identify strategies and techniques of good language learners," it soon became apparent that "the investigation of other factors such as personality characteristics, cognitive styles, attitudes, and learning environments was crucial" (p. 101). A number of these factors were therefore included in the study in an effort to see which ones contributed to success in language learning.

Since this is the most comprehensive study of this nature made to date, it is worth looking at in some detail insofar as cognitive style is implicated. There were two criteria for success, both measuring spoken French ability. The first was the listening section of the IEA (International Association for the Evaluation of Educational Achievement) French Achievement Test at an appropriate level, and the second, an imitation task in which the student was required to repeat ten sentences each nine to fifteen syllables long. The rationale behind the latter test is based on earlier findings (Naiman, 1974; Swain, et al., 1974) that students who have not learned the structures used in a sentence which exceeds short-term memory capacity cannot repeat the sentence accurately. Since the experimenter controls the structures he

wishes to test, there is no opportunity for the student to avoid structures he does not know.

The cognitive styles which the Naiman group chose to investigate were field independence/dependence (measured by the Hidden Figures Test, a variant of Witkin's EFT), constricted vs. flexible control (measured by the Speed of Color Discrimination Test, a version of the Stroop Color Word Interference Test), and breadth of categorizing (measured by Pettigrew's Category-Width Scale -- Estimation Questionnaire). In addition, the investigators included, under personality, intolerance to ambiguity (measured by a questionnaire developed by Budner, 1962). This aspect of personality is probably related to the cognitive style dimension of incongruous or unrealistic experience in the Messick model. Naiman and his associates hypothesized that the successful language learner would be field independent ("able to focus on those language stimuli relevant to the language learning task at hand and to disregard the inappropriate ones"), would exhibit flexible control when confronted by two conflicting stimuli ("resisting the overpowering influence of a firmly entrenched first language system"), would be intermediate on the categorizing scale (neither overgeneralizing nor overdifferentiating), and would be tolerant of ambiguity (Naiman et al., 1978, pp. 30-31).

The Naiman group found that only two of the measures mentioned above were significant predictors of success: field independence and tolerance of ambiguity. A breakdown of the results by grade levels suggests that tolerance of ambiguity may be more important at early stages of learning while field independence may be more important at more advanced stages. In addition, from a breakdown of the errors in the imitation test, it was found that field dependent learners were more likely to "omit whole segments of sentences instead of repeating at least the specific units they knew which were embedded in larger unknown segments" (Naiman et al., 1978, p. 76). Field dependent learners also made more errors which seemed to be caused by distraction from other elements in the sentence.

The failure of the Naiman group to find any relation between the other two dimensions of cognitive style and success in language learning may mean that there is in fact no relationship in this situation. However, the investigators tend to believe that their measures of the constructs may not be adequate. While they had their most serious reservations about some of the personality measures not discussed in this paper, the possibility that some of the measures of cognitive style do not have construct validity certainly exists. It is also a possibility that the criterion measures may lack construct validity, especially the imitation test, which has not been widely used.

More recently, a study of the good language learner has been under way at the English Language Institute at the University of Michigan (Brown, 1977, 1978). Four variables are being examined there, including the cognitive style dimension of field independence/dependence. Preliminary results suggest that "field independence . . . is a necessary cognitive style for the usual classroom-oriented language learning, but that field dependence . . . is necessary for effective communication in 'natural' untutored contexts" (Brown, 1978, p. 3). Thus it appears that the relationship of this cognitive style dimension to language learning is very complex, and that much more study will be necessary before it can be definitively described.

It seems clear that studies of the good language learner have yielded some valuable information, and, indeed, some of this is already being put to practical use. Starting from the premise that certain styles and strategies seem to be associated with successful language learning, Omaggio and Birckbichler (1977) have worked out a number of techniques that a teacher can use to try to effect appropriate changes in the language behavior of students who are having difficulty. However, as Omaggio (1978) points out, "research on the good language learner is still in the preliminary stages" (p.). So far as cognitive style is concerned, the results reported to date have raised more questions than they have answered.

The relationships discussed in this paper need to be validated by more research and explored in more detail. In addition, other correlations between various styles and different aspects of language learning should be investigated. (Reflectiveness/impulsivity would seem to be of particular relevance to all aspects of language learning.) Longitudinal studies would also be helpful in determining the relationship of style to success for a given learner over time.

Other directions for further work in cognitive style are suggested by the findings reported in this paper. They include:

1. ATI research which looks at the outcomes when students with various styles are exposed to various instructional methods (e.g., computer-assisted instruction) or to teachers with matching or non-matching styles.
2. Additional research in style or strategy modification.
3. Investigation of how persons who are in the middle of a style dimension (and may therefore exhibit more flexibility than persons at either extreme, as suggested by Nelson, 1974) react to the various apects of language learning.
4. Investigation of interlanguage grammars (as described in Selinker, 1972, and Richards, 1971) for insights into how learners with particular cognitive styles acquire various aspects of a language system.

Much has been learned about cognitive style in the past 25 years -- enough to convince most people that the construct is worth studying and that it has particular value for teachers who would know their students. Our knowledge is still fragmentary. We are not yet able to discern the complete pattern. Even so, we can put what we have learned to use in the learning situation, at the same time searching for new understanding.

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